JC10 Rec'd PCT/PTO 19 FEB 2002

FORM PT (Rev. 9-2)

U S DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

ATTORNEY'S DOCKET NUMBER: 025219-386

U S APPLICATION NO (If known, see 37 C F R 1.5): Unassigned 10/049777

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/FR00/02487	September 8, 2000	September 9, 1999

TITLE OF INVENTION
DEVICE FOR PRODUCING A MODULATED ELECTRIC FIELD FOR AN ELECTRODE AND ITS APPLICATION IN FLAT FIELD EMISSION SCREENS

APPLICANT(S) FOR DO/EO/US
Aime PERRIN; Adeline FOURNIER; Brigitte MONTMAYEUL

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☐ This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (21) indicated below.
4. ☒ The US has been elected by the expiration of 19 months from the priority date (Article 31).
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
   a. ☐ is attached hereto (required only if not communicated by the International Bureau).
   b. ☒ has been communicated by the International Bureau.
   c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☒ An English language translation of the International Application as filed (35 U.S.C. 371(c)(2))
   a. ☒ is attached hereto.
   b. ☐ has been previously submitted under 35 U.S.C. 154(d)(4).
7. ☐ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
   a. ☐ are attached hereto (required only if not communicated by the International Bureau).
   b. ☐ have been communicated by the International Bureau.
   c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
   d. ☐ have not been made and will not be made.
8. ☐ An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☐ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. ☐ An English language translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11 to 20 below concern document(s) or information included:

11. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☒ A FIRST preliminary amendment.
14. ☐ A SECOND or SUBSEQUENT preliminary amendment.
15. ☐ A substitute specification.
16. ☐ A change of power of attorney and/or address letter.
17. ☐ A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821 - 1.825.
18. ☐ A second copy of the published international application under 35 U.S.C. 154(d)(4).
19. ☐ A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).
20. ☒ Other items or information:

PCT Request, PCT Publication, Chapter II Demand, International Preliminary Examination Report

21839

JC13 Rec'd PCT/PTO 19 FEB 2002

U.S. APPLICATION NO (If known, see 37 C.F.R. 1.5)	INTERNATIONAL APPLICATION NO	ATTORNEY'S DOCKET NUMBER
Unassigned 10/049777	PCT/FR00/02487	025219-386

21. ☒ The following fees are submitted:	CALCULATIONS	PTO USE ONLY
Basic National Fee (37 CFR 1.492(a)(1)-(5)):		
Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO $1,040.00 (960)		
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO $890.00 (970)		
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO $740.00 (958)		
International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4) $710.00 (956)		
International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4) $100.00 (962)		
ENTER APPROPRIATE BASIC FEE AMOUNT =	$ 890.00	
Surcharge of **$130.00 (154)** for furnishing the oath or declaration later than 20 ☐ 30 ☐ months from the earliest claimed priority date (37 CFR 1.492(e)).	$	

Claims	Number Filed	Number Extra	Rate		
Total Claims	25 -20 =	5	X$18.00 (966)	$ 90.00	
Independent Claims	5 -3 =	2	X$84.00 (964)	$ 168.00	
Multiple dependent claim(s) (if applicable)			+ $280.00 (968)	$	
TOTAL OF ABOVE CALCULATIONS =				$ 1,148.00	
Reduction for 1/2 for filing by small entity, if applicable (see below).			+	$	-
SUBTOTAL =				$ 1,148.00	
Processing fee of **$130.00 (156)** for furnishing the English translation later than 20 ☐ 30 ☐ months from the earliest claimed priority date (37 CFR 1.492(f)).			+	$	
TOTAL NATIONAL FEE =				$ 1,148.00	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). **$40.00 (581)** per property			+	$	
TOTAL FEES ENCLOSED =				$ 1,148.00	
				Amount to be refunded:	$
				charged:	$

a. ☐ Small entity status is hereby claimed.

b. ☒ A check in the amount of $ 1,148.00 to cover the above fees is enclosed.

c. ☐ Please charge my Deposit Account No. 02-4800 in the amount of $_____ to cover the above fees. A duplicate copy of this sheet is enclosed.

d. ☐ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 02-4800. A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

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SIGNATURE

Robert E. Krebs
NAME

25,885
REGISTRATION NUMBER

February 14, 2002
DATE

10/049777
JC13 Rec'd PCT/PTO 19 FEB 2002

Patent
Attorney's Docket No. 025219-386

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of	)	
	)	
Perrin, et al.	)	Group Art Unit: Unassigned
	)	
Application No.: Unassigned	)	Examiner: Unassigned
	)	
Filed: Herewith	)	
	)	
For: DEVICE FOR PRODUCING A MODULATED ELECTRIC FIELD FOR AN ELECTRODE AND ITS APPLICATION IN FLAT FIELD EMISSION SCREENS	)	

PRELIMINARY AMENDMENT

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

Prior to examination, please amend the subject application as follows:

IN THE SPECIFICATION

Please amend the specification by inserting before the first line the sentence:

"This application is a national phase of PCT/FR00/02487 which was filed on September 8,2000, and was not published in English."

IN THE CLAIMS:

Please amend claim 4 as follows:

4. (Amended) Device according to claim 1, characterized in that the first (25) and the second electrode (27) and the means forming modulation electrode (28,29) are arranged in parallel.

Please amend claim 5 as follows:

5. (Amended) Device according to claim 1, characterized in that the means forming modulation electrode comprise two electrodes (28, 29) surrounding the first electrode (25).

Please amend claim 13 as follows:

13. (Amended) Display screen according to claim 10, characterized in that the means forming modulation electrode comprises two electrodes (38, 39) surrounding said cathode electrode (35).

Please amend claim 14 as follows:

14. (Amended) Display screen according to claim 10, characterized in that, as said cathode electrode is located between said anode electrode and the means forming modulation electrode, the means forming modulation electrode (50) is made up of a single electrode.

Please amend claim 15 as follows:

15. (Amended) Display screen according to claim 10, characterized in that, as said cathode electrode is located between said anode electrode and the means forming modulation electrode, said cathode electrode (35) and the means forming modulation electrode (38, 39) are separated by a layer of insulating material (34).

Please amend claim 16 as follows:

16. (Amended) Display screen according to claim 10, characterized in that as said cathode electrode (35) comprises a conductor element on which is deposited a layer of emissive material (30).

Please amend claim 20 as follows:

20. (Amended) Display screen according to claim 10, characterized in that it is of the matrix type, the crossing of lines and columns defining pixels.

Please amend claim 23 as follows:

23. (Amended) Display screen according to claim 21, characterized in that the conductor lines (Y_i, Y_j, Y_k) comprise windows (80) facing the conductor columns (85), the emissive material (87) supported by the conductor columns being only present on the areas of the conductor columns corresponding to the windows (80).

PLEASE ADD THE FOLLOWING CLAIMS:

26. Device according to claim 3, characterized in that the first (25) and the second electrode (27) and the means forming modulation electrode (28,29) are arranged in parallel.

27. Device according to claim 4, characterized in that the means forming modulation electrode comprise two electrodes (28, 29) surrounding the first electrode (25).

28. Display screen according to claim 12, characterized in that the means forming modulation electrode comprises two electrodes (38, 39) surrounding said cathode electrode (35).

29. Display screen according to claim 12, characterized in that, as said cathode electrode is located between said anode electrode and the means forming modulation electrode, the means forming modulation electrode (50) is made up of a single electrode.

30. Display screen according to claim 12, characterized in that, as said cathode electrode is located between said anode electrode and the means forming modulation electrode, said cathode electrode (35) and the means forming modulation electrode (38, 39) are separated by a layer of insulating material (34).

31. Display screen according to claim 15, characterized in that as said cathode electrode (35) comprises a conductor element on which is deposited a layer of emissive material (30).

32. Display screen according to claim 19, characterized in that it is of the matrix type, the crossing of lines and columns defining pixels.

33. Display screen according to claim 22, characterized in that the conductor lines (Y_i, Y_j, Y_k) comprise windows (80) facing the conductor columns (85), the emissive material (87) supported by the conductor columns being only present on the areas of the conductor columns corresponding to the windows (80).

Application Serial No. Unassigned
Attorney's Docket No. 025219-386

REMARKS

Entry of the foregoing amendment to the Specification is requested to comply with the requirements of 37 C.F.R. 1.78(a)(2).

The claims of the subject application have been amended to avoid multiple dependency. Favorable consideration of the subject application is respectfully requested.

Attached hereto is a marked-up version of the changes made to the claims by the current amendment. The attached page is captioned "**Version with markings to show changes made.**"

Respectfully submitted,

BURNS, DOANE, SWECKER & MATHIS, L.L.P.

By: _____
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Date: February 14, 2002

VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the claims:

Claims 4, 5, 13 - 16, 20 and 23 have been amended as follows:

4. Device according to ~~any one of~~ claims 1 ~~to 3~~, characterized in that the first (25) and the second electrode (27) and the means forming modulation electrode (28,29) are arranged in parallel.

5. Device according to ~~any one of~~ claims 1 ~~to 4~~, characterized in that the means forming modulation electrode comprise two electrodes (28, 29) surrounding the first electrode (25).

13. Display screen according to ~~any one of~~ claims 10 ~~to 12~~, characterized in that the means forming modulation electrode comprises two electrodes (38, 39) surrounding said cathode electrode (35).

14. Display screen according to ~~any one of~~ claims 10 ~~to 12~~, characterized in that, as said cathode electrode is located between said anode electrode and the means forming modulation electrode, the means forming modulation electrode (50) is made up of a single electrode.

15. Display screen according to ~~any one of~~ claims 10 ~~to 12~~, characterized in that, as said cathode electrode is located between said anode electrode and the means forming modulation electrode, said cathode electrode (35) and the means forming modulation electrode (38, 39) are separated by a layer of insulating material (34).

16. Display screen according to ~~any one of~~ claims 10 ~~to 15~~, characterized in that as said cathode electrode (35) comprises a conductor element on which is deposited a layer of emissive material (30).

20. Display screen according to ~~any one of~~ claims 10 ~~to 19~~, characterized in that it is of the matrix type, the crossing of lines and columns defining pixels.

23. Display screen according to claims 21 ~~or 22~~, characterized in that the conductor lines (Y_i, Y_j, Y_k) comprise windows (80) facing the conductor columns (85), the emissive material (87) supported by the conductor columns being only present on the areas of the conductor columns corresponding to the windows (80).

Claims 26 - 33 have been added.

10/049777
JC13 Rec'd PCT/PTO 19 FEB 2002

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DEVICE FOR PRODUCING A MODULATED ELECTRIC FIELD FOR AN ELECTRODE AND ITS APPLICATION IN FLAT FIELD EMISSION SCREENS

Technical field

The present invention concerns a device to produce a modulated electric field for an electrode. This applies in particular to flat field emission screens.

State of the art

The devices for visualization by cathodoluminescence excited by field emission are well known. Such a device comprises a cathode arranged facing an anode. The cathode is a flat structure emitting electrons and the anode is another flat structure covered with a luminescent film. These structures are separated by a space in which a vacuum is created.

The cathode can be a source of microtips or a source with a low threshold field emissive material (the threshold field being the electric field needed to extract electrons from a material), for example nanostructures or carbon. The sources with an emissive material used in screen devices are usually shown in two forms - a diode type structure or a triode type structure.

Figure 1 shows in a transversal cross-section view, a flat field emission screen operating according

to a diode type structure. The cathode 1 is made up of a plate of insulating material 3 supporting parallel metallic tracks 4 and covered with layers of an emissive material 5. The anode 2 is an insulating and transparent plate 6, for example in glass, supporting parallel conductor tracks 7 and at right angles to the cathode tracks 4. The tracks 7 are made by the etching of a layer of a transparent conducting material such as tin and indium mixed oxide (ITO). The tracks 7 are covered with films of phosphor 8.

The cathode plate and anode plate are placed facing one another, the tracks being opposite to make up a matrix structure. The crossing of the track networks forms image elements or pixels. By applying an adequate potential difference between one track 4 of the cathode and one track 7 of the anode, an emission of electrons occurs on the zone of the track 4 corresponding to the considered pixel, and the zone of the phosphor 8 facing is excited. A complete image can be obtained on the screen by successively supplying each line of the screen and by sweeping.

So that electrode emission occurs, an emissive material with low threshold field such as carbon needs a minimum electric field of several V/μm between an anode track and a facing cathode track. If the space between these tracks is 1 mm, a potential difference of several kV must therefore be applied, usually between 5,000 and 10,000 V. This leads to two main problems. The first is the resistance in voltage - there is danger of breakdown between anode and cathode and above all between two adjacent tracks. The second problem

results from the need to switch a voltage of several kV when sweeping the screen. This problem can be resolved by reducing the space between anode and cathode which facilitates reducing in the same way the potential difference between them while maintaining the same electric field. The disadvantage of this solution is that this decrease in potential causes a decrease in the output of the phosphors and less brilliance in the screen.

The triode type structure has been suggested in order to try and remedy these problems. Figure 2 shows in transversal cross-section a flat field emission screen implementing such a structure. The cathode 11 is made up of a glass plate 13 supporting parallel metallic tracks 14 and covered with layers 15 of an emissive material, carbon for example.

The tracks 14 are placed on the bottom of trenches etched in a layer of insulating material 10, the layer 10 being covered with a metal layer 19 serving as extracting gate. The anode 12 can be made up of a transparent plate 16 with for example a transparent and conductive film 17 covered by a film of luminescent material 18.

An emission of electrons by the emissive material can be obtained by applying, between the extraction gate 19 and track 14, a potential difference so that the resulting electric field on the emissive material is greater than the threshold field of this material, usually several V/μm. As the distance separating the extraction gate from the tracks is very much smaller than the distance separating the anode from the

cathode, the potential difference to be applied is reduced in the same way.

As the lines of electric field go from tracks 14 to the extraction gate 19, a large part of the electrons emitted is going to be trapped by the gate. The triode type structure therefore has the disadvantage resulting from the fact that very few of the electrons emitted reach the phosphor layer.

Such a visualization device of triode type structure therefore enables avoiding the risk of electric breakdown and the problems of high voltage switching. However, these improvements are obtained to the detriment of electron density emitted which reach the luminophore or phospor layer. Moreover, this type of structure needs the realization of a deposit of emissive material solely on the bottom of trenches which presents considerable difficulties.

Summary of the invention

The present invention provides for solving the problems set forth above. The solution consists in applying a modulation electric field near to an electrode in the vicinity of which one wishes to obtain an electric field of specified value. Depending on the case, the modulation electric field will have the effect of decreasing or increasing the value of the electric field in the vicinity of the electrode in question.

The first object of the invention concerns a device which permits producing an electric field between a first and a second electrode, comprising:

- means for applying a potential difference between these two electrodes, allowing to obtain, if this potential difference is applied alone, a predetermined value of electric field in the vicinity of the first electrode,

- means forming modulation electrode located near the first electrode, either on the same plane or so that the first electrode is inserted between the second electrode and said means forming modulation electrode,

- control means for applying a potential difference between the means forming modulation electrode and the first electrode in order to obtain through the contribution of said potential differences another predetermined value of electric field in said vicinity of the first electrode.

In a first case, the means for applying a potential difference between the first and the second electrode and the control means, supply potential differences such that the value of the electric field in said vicinity of the first electrode is greater than the value which would be due to the potential difference alone between the first and the second electrode.

In a second case, the means for applying a potential difference between the first and the second electrode and the control means, supply potential differences so that the value of the electric field in said vicinity of the first electrode is lower than the

value which would be due to the potential difference alone between the first and the second electrode.

Conveniently, the first and the second electrode and the means forming modulation electrode are arranged parallel.

The means forming modulation electrode can comprise two electrodes surrounding the first electrode.

If the first electrode is inserted between the second electrode and the means forming modulation electrode, the means forming modulation electrode can be made up by a single electrode.

The second object of the invention concerns a process for producing an electric field between a first and a second electrode comprising:

- the application of a potential difference between the first and the second electrode so as to obtain, if this potential difference was applied alone, a predetermined value of the electric field in the vicinity of the first electrode,

- the application of a potential difference between the first electrode and means forming modulation electrode and located near to the first electrode, either in the same plane or so that the first electrode is inserted between the second electrode and said means forming modulation electrode, in order to obtain in association with the electric field due to the application of the potential difference between the first the second electrode, another predetermined value of electric field.

In a first case, the application of the potential difference between the first and the second electrode is such that if this potential difference was applied alone, the electric field in said vicinity of the first electrode would be greater than said other predetermined value.

In a second case, the application of the potential difference between the first and the second electrode is such that if this potential difference was applied alone, the electric field in said vicinity of the first electrode would be lower than said other predetermined value.

A third object of the invention concerns a field emission screen comprising an anode plate and a cathode plate facing one another, the anode plate comprising on its internal surface of the screen at least one electrode supporting phosphor means, the cathode plate comprising on its internal surface of the screen at least one electrode emitting electrons at least partially facing the anode electrode, this cathode electrode becoming emitter of electrons when the electric field in its vicinity exceeds a threshold value, the screen also comprising application means for a potential difference between said anode electrode and said cathode electrode, characterized in that the screen further comprises means forming modulation electrode located in the vicinity of the cathode electrode, either on the same plane or so that the cathode electrode is inserted between the anode electrode and said means forming modulation electrode, the screen also comprising control means for applying a

potential difference between the cathode electrode and the means forming modulation electrode, the means for applying potential differences is such it provides for obtaining in said vicinity of the cathode electrode a predetermined value of electric field resulting from the contribution of said potential differences, said predetermined value being as one wishes either lower than said threshold value, or greater than said threshold value.

In a first case, the means for applying a potential difference between said anode electrode and said cathode electrode is such that, in the absence of a potential difference applied between the cathode electrode and the means forming modulation electrode, said predetermined value of electric field is lower than said threshold value.

In a second case, the mains for applying a potential difference between said anode electrode and said cathode electrode is such that, in the absence of a potential difference applied between the cathode electrode and the means forming modulation electrode, said predetermined value of electric field is greater than said threshold value.

The means forming modulation electrode can comprise two electrodes surrounding the cathode electrode.

If the cathode electrode is located between the anode electrode and the means forming modulation electrode, the means forming modulation electrode can be made up of a single electrode.

Advantageously, the cathode electrode and the means forming modulation electrode are separated by a layer of insulating material.

Preferably, the cathode electrode comprises a conductive part on which is deposited a layer of emissive material. This layer of emissive material can be separated from the conductive part by a resistive film. The layer of emissive material need only cover part of the resistive film. The emissive material can be a material deposited on the resistive film by a catalyst material deposited on the resistive film and on which the emissive material settles preferentially.

The display screen is conveniently of the matrix type, the crossing of lines and columns defining pixels.

According to a preferred arrangement, the anode plate comprises a common electrode with phosphor means, the cathode plate comprises a plate supporting conductor lines constituting the means forming modulation electrode, covered with a layer of dielectric material, the layer of dielectric material supporting the conductive columns, the lines and columns forming a matrix arrangement connected to addressing means and defining pixels, the conductive columns having an emissive material. Each pixel can correspond to the crossing of a line and several column conductors.

According to a specific arrangement, the conductive lines comprise windows facing the conductor columns, the emissive material supported by the

conductor columns being only present on the areas of the conductor columns corresponding to the windows.

A fourth object of the invention concerns a process for the use of a field emission screen comprising at least one anode electrode and at least one cathode electrode facing, the cathode electrode comprising an emissive material emitting electrons when the electric field in the vicinity of the cathode electrode exceeds a threshold value, characterized in that, in order to obtain an emission of electrons on the part of the emissive material, it comprises:

- the application of a potential difference between the anode electrode and the cathode electrode so as to obtain in the vicinity of the cathode electrode, if this potential difference was applied alone, an electric field of value lower than said threshold value,

- the application of a potential difference between the cathode electrode and the means forming modulation electrode located near the cathode electrode, either in the same plane or so that the cathode electrode is inserted between the anode electrode and said means forming modulation electrode, so as to obtain in said vicinity of the cathode electrode, in association with the electric field due to the application of the potential difference between the anode and cathode electrodes, an electric field value greater than said threshold value.

A fifth object of the invention concerns a process for the use of a field emission display screen comprising at least one anode electrode and at least

one cathode electrode facing, the cathode electrode comprising an emissive material emitting electrons when the electric field in the vicinity of the cathode electrode exceeds a threshold value, characterized in that, in order to avoid an emission of electrons from the emissive material, it comprises:

- the application of a potential difference between the anode electrode and the cathode electrode so as to obtain in the vicinity of the cathode electrode, if this potential difference was applied alone, an electric field greater in value than said threshold value,

- the application of a potential difference between the cathode electrode and the means forming modulation electrode located in the vicinity of the cathode electrode, either in the same plane or so that the cathode electrode is inserted between the anode electrode and said means forming modulation electrode, so as to obtain in said vicinity of the cathode electrode, in association with the electric field due to the application of the potential difference between the anode and cathode electrodes, an electric field value lower than said threshold value.

Brief description of the drawings

The invention will be better understood and other advantages and specificities will come to light on reading the following descriptions, given as non-restricting examples, accompanied by attached drawings among which:

- figure 1, already described, is a perspective view, in transversal cross-section, of a flat field emission screen according to the prior art;

- figure 2, already described, is a transversal cross-section of a second flat field emission screen according to the prior art;

- figures 3A and 3B are cross-sections illustrating the operation of a device according to the invention;

- figure 4 is a transversal cross-section and partial view of a flat field emission screen according to the invention;

- figures 5 to 9 show embodiments of realization of an element of flat field emission screen according to the invention;

- figure 10 is a perspective view of a cathode plate for flat field emission screen according to the invention;

- figures 11 to 13 are diagrams of voltages to be applied to address a pixel of screen according to the invention.

Detailed description of realization modes of the invention.

Figures 3A and 3B are cross-section views illustrating the workings of a device according to the invention. The device comprises a plate 21 designated in this example as cathode plate. The cathode plate 21 comprises a support plate 23 supporting an electrode 25 surrounded by two parts 28 and 29 of a same electrode.

The device also comprises a plate 22 designated in this example as anode plate. The anode plate 22 comprises a support plate 26 supporting an electrode 27. The anode plate and cathode plate are arranged facing one another and parallel, their corresponding electrodes facing each other. They are separated by the distance d.

Figure 3A shows the case when a potential +V is applied on the electrode 27 and a zero potential on electrode 25 as well as on the parts 28 and 29. A uniform electric field of value V/d is established within the device. Equipotential lines are shown by broken lines on figure 3A. The line represented nearest to the electrode 25 corresponds to the potential V_1, intermediate between the potential of the cathode electrode 25 and that of the anode electrode 27.

Figure 3B shows the case when a potential +V is applied on the electrode 27, a zero potential on electrode 25 and a potential V_1 on the parts 28 and 29. There then occurs a shift and deformation of the equipotentials which cause a narrowing of the equipotentials above the cathode electrode 25, therefore an increase of the electric field at this point. The same effect is obtained if a potential difference is fixed between the electrode 27 and the parts 28 and 29 and the electrode 25 is taken to a more negative potential than that of the parts 28 and 29 as compared with the electrode 27.

Inversely, if one wishes to decrease the value of the existing electric field on the electrode 25 by an imposed potential difference between the electrodes 25

(the potential +V) and 27 (a zero potential), the parts 28 and 29 can be brought to the potential - V_1.

The electrode made up of the parts 28 and 29 can therefore be designated under the term modulation electrode.

Figure 4 is a partial view, in transversal cross-section, of a flat field emission screen to which the control mode according to the invention is applied. This screen comprises a cathode plate 31 and an anode plate 32 placed facing one another and parallel. They have electrodes on their inside face. Spacers, not shown, provide constant spacing between the cathode plate and anode plate and a vacuum is created inside the screen.

The cathode plate 31 comprises a support plate 33 in insulating material, for example glass, on which a network of metal strips 38, 39 are placed successively to make up the modulation electrodes, an insulating film 34 (for example silica) then a network of cathode electrodes 35 placed in the intervals of the underlying circuit. On figure 4, a single electrode of the cathode has been shown. It is either made up of a material with low threshold field, or covered by a layer of material with low output work, for example carbon or nanostructures. On figure 4 the cathode electrode 35 has a layer 30 of such a material. The strips 38 and 39 corresponding to an electrode 35 are connected together electrically to make up a modulation electrode.

The anode plate 32 comprises a support plate 36 in insulating material and transparent - usually glass - covered successively with a film 37 of transparent and

conductive material, for example ITO, and a film 20 of luminescent material.

The screen can be used according to the first operating mode as follows. Between the anode electrode 37 and the cathode electrode 35 a potential difference is applied such that the electric field resulting from the emitting electrode is lower than the extraction threshold field of electrons from the emissive material 30. There is therefore no emission of electrons under the effect of this single field.

If the modulation electrode 38, 39 is brought to an intermediate potential between that of the anode and that of the emitting electrode, a shift and deformation of equipotentials occurs causing an increase of the electric field on the emitting electrode. The potential of the modulation electrode can be chosen so that the electric field on the emitting electrode becomes greater than the threshold field of the emissive material. There will then be emission of electrons. These electrons are emitted at right angles to the emission electrode. They are then accelerated by the anode field and strike the luminescent film 20 covering the anode electrode 37. In this way, for any value V of the potential applied to the emissive electrode, there is a value V_s of potential which, applied to the modulation electrode, makes it possible to have an electric field on the emitting electrode equal to the threshold field of emission of the material, V_s being greater than V:

$$V_s = V + \Delta V_s$$

For any value of potential of the modulation electrode greater than V_s, there is emission of electrons.

As an example, the anode plate 32 and cathode plate 31 can be 1 mm apart, the metal strips 38 and 39 can have a width of 20 μm and be 10 μm apart. The insulating layer 34 can be a film of silica, 1 μm thick. The cathode electrode 35 can have a width of 5 μm and be in the centre of the space separating the metal strips 38 and 39. For an emissive material 30 with a threshold field of 5 to 6 V/μm, which is usual, a potential of + 3000 V is applied on the anode as compared to the cathode, which gives an electric field of 3 V/μm on the emitting electrode, this field being lower than the threshold field. As the cathode electrode 35 is being maintained at 0 V, if the modulation electrode 38, 39 is brought to + 30 V, the electric field on the surface of the emissive electrode changes to 7 V/μm which is greater than the threshold field. It appears therefore that the voltages to be switched over remain low, usually several tens volts which does not cause any problems.

The screen can also be used according to the second operating mode as follows. Between the anode electrode 37 and the cathode electrode 35 a potential difference is applied and the result is an electric field on the emitting electrode. If this electric field is greater than the extraction threshold field of electrons from the emissive material 30, there is emission of electrons under the effect of this field alone. If the modulation electrode 38,39 is brought to a lower potential than that of the cathode electrode

35, a shift and deformation of equipotentials occurs causing a decrease of the electric field on the emitting electrode. The potential of the modulation electrode can be chosen so that the electric field on the emitting electrode becomes lower than the threshold field of the emissive material and thus facilitates stopping the emission of electrons. In this way, for any value V of the potential applied to the emitting electrode, there is a value V_s of potential which, applied to the modulation electrode, makes it possible to have an electric field on the emitting electrode equal to the threshold field of emission of the material, V_s being lower than V:

$$V_s = V - \Delta V_s$$

For any value of potential of the modulation electrode greater than V_s, there is emission of electrons. For any value lower than V_s, emission is eliminated.

The cathode plate, and notably the distribution of electrodes can present different embodiments. Figures 5 to 9 show some of the embodiments possible. For reasons of clarity, only a single cathode electrode has been shown in these drawings.

Figure 5 shows a cathode plate 41 comprising a plate 43 in insulating material (glass for example) supporting a circuit of modulation electrodes, each formed by two conductive strips 48 and 49 connected together. The plate 43 also has an insulating film 44, in silica for example. On the insulating film 44 cathode electrodes 45 are placed, in correspondence with the modulation electrodes 48, 49. Each cathode electrode is placed above the interval separating the

corresponding conductive strips 48 and 49 and symmetrical with the latter. On these cathode electrodes 45 are placed successively a resistive film 46 and a layer of emissive material 47. The function of the resistive film 46 is to standardize the emission on the surface of the emissive electrode which is formed by the superposition of the elements 45, 46 and 47. In this way very strong random emissions are prevented which can lead to breakdowns occurring. This arrangement facilitates reducing the superposition of the cathode electrode and the modulation electrode and thereby reducing to the minimum the parasistic capacity which there is between them, which is considerable when the surface of the screen is important. Certain devices do not need this precaution against parasistic capacity. The shape of the modulation electrode can change from the one shown in figure 5 to the shape shown in figure 6 where it is only made up of a single strip. It can obviously take on all the intermediary shapes.

Figure 6 shows a cathode plate comprising, as in figure 5, a support plate 53, an insulating film 54, a cathode electrode 55, a resistive film 56 and a layer of emissive material 57. On the other hand, the modulation electrode 50 is made up of a single conductive strip as the emitting electrode is centred on the modulation electrode.

Figure 7 illustrates an intermediary form. Here is the structure of the cathode plate as shown in figure 5. The cathode plate 61 comprises a support plate 63, two conductive strips 68 and 69 forming the modulation

electrode, the insulating film 64 supporting the emitting electrode made up by the cathode electrode 65, the resistive film 66 and the layer of emissive material 67. The emitting electrode has in this embodiment the same width as the gap separating the two conductive strips 68 and 69.

In figure 8, there is also the structure of the cathode plate as seen in figure 5. The cathode plate 71 comprises a support plate 73, two conductive strips 78 and 79 forming the modulation electrode, the insulating film 74 supporting the emitting electrode made up by the cathode electrode 75, the resistive film 76 and the layer of emissive material 77. In this embodiment, the layer of emissive material 77 only covers the central section of the resistive film 76. This layout enables obtaining a more condensed bundle of electrons by eliminating electrons which could be subjected to the edge effects of the cathode electrode 75. This layout can be combined with the other embodiments described previously.

On figure 9, there is still the structure of the cathode plate as shown in figure 5. The cathode plate 91 comprises a support plate 93, two conductive strips 98 and 99 forming the modulation electrode, the insulating film 94 supporting the emitting electrode comprising the cathode electrode 95 and the resistive film 96. In this embodiment, the emitting electrode also comprises studs 92 in catalyst material, for example nickel, iron, cobalt or an alloy of these metals, these studs being placed on the resistive film 96. The studs 92 have emissive material 97, for example

carbon, which is laid preferably on the catalyst material to make up emissive sites.

Figure 10 is a explosed and perspective view of a cathode plate for flat field emission screen of the matrix type implementing the invention. The cathode plate 81 comprises a plate 83, in glass for example, supporting a network of conductive strips Y forming lines, for example Y_i, Y_j, and Y_k. In these strips, openings or windows 80, for example rectangular, have been fashioned. This network of lines is covered by a layer of dielectric material 84 on which parallel conductive strips 85 have been laid and at right angles to the strips Y. The conductive strips 85 are, in this example of realization, grouped in threes to constitute the columns X_i, X_j, and X_k. The conductive strips 85 are each covered with a layer of resistive material 86 and emissive material. In the example in figure 10, the emissive material 87 has only been laid on the useful areas, i.e. on the areas of columns located above windows 80 made in the lines. In this way two networks are obtained, one of lines and the other of columns, mutually at right-angles. A pixel is constituted by the crossing of a line and a column.

Figure 11 is an example of diagrams of the voltages to be applied in order to address a pixel of a screen comprising a cathode plate of the type shown in figure 10 and in the case when the voltage applied between the anode and the cathode creates an electric field lower than the emission threshold field. This example allows reducing to the minimum the number of voltage values necessary. To address the pixel X_j, Y_j

the anode, not shown, is brought up to a potential V_A, the column X_j to the potential V_0 and the line Y_j to a potential V_1 (V_1 being intermediary between V_0 and V_A). The other columns X are brought up to the potential V1 whilst the other lines Y are brought to the potential V_0. The potential V_1 is chosen so that the increase of the electric field on the emitting electrode is such that this electric field becomes greater than the threshold field.

Figure 12 is a diagram of the voltages to be applied to address a pixel of a display screen comprising a cathode plate of the type shown in figure 10 and in the case when the voltage applied between the anode and the cathode creates an electric field higher than the emission threshold field. To address a pixel X_j, Y_j the anode, not shown, is brought up to a potential V_A, and the column X_j to the potential V_0. If one calls d the distance separating the anode from the cathode, the electric field resulting from this difference of potential $(V_A - V_0)/d$ is greater than the emission threshold field of the material. So that the pixel X_j, Y_j emits, the potential V_1 of the line Y_j must be greater than the voltage V_S. On the column X_J, in order for the pixels X_j, Y_i and X_j, Y_k be off, the potential V_2 of lines Y_i and Y_k must be lower than V_s. On the line Y_j, the two pixels X_i, Y_j and X_k, Y_j must be off. For this, the potential V_3 of columns X_i and X_k must be greater than $V_1 + \Delta V_s$, ΔV_s being equal to $V_0 - V_s$. The pixels X_i,Y_1 / X_1,Y_k / X_k,Y_i and X_k,Y_k have a column voltage equal to V_3 and a line voltage equal to V_2. In fact, $V_2<V_s$, $V_3>V_1 + \Delta V_s$, $V_1>V_s$ and $V_3>V_s + \Delta V_s$. The

difference between the voltages of columns X_i-X_k and the lines Y_i-Y_k being higher than ΔV_s and the line voltages being lower than the column voltages, the corresponding pixels do not emit.

Figure 13 is also a voltage diagram applicable to the preceding case. Among all the values possible for V_1, V_2 and V_3, an easier solution can be chosen. Thus, given that $V_1=V_0$ and $\Delta V > \Delta V_s$ in order to address a pixel X_j, Y_j a voltage V_0 must be applied on the column X_j and the line Y_j, the other columns being brought up to a voltage $V_0 + \Delta V$ and the other lines to a voltage $V_0 - \Delta V$.

CLAIMS

1. Device for producing an electric field between a first electrode (25) and a second electrode (27), comprising:

- means for applying a potential difference between these two electrodes (25, 27), allowing to obtain, if this potential difference is applied alone, a predetermined value of electric field in the vicinity of the first electrode (25),
- means forming modulation electrode (28, 29) located near to the first electrode (25), either in the same plane, or so that the first electrode is inserted between the second electrode and said means forming modulation electrode,
- means of control for applying a potential difference between the means forming modulation electrode (28, 29) and the first electrode (25) in order to obtain through the contribution of said potential differences another predetermined value of electric field in said vicinity of the first electrode (25).

2. Device according to claim 1, characterized in that the means for applying a potential difference between the first (25) and the second electrode (27) and the control means supply potential differences such that the value of the electric field in said vicinity of the first electrode (25) is greater than the value which would be due to the potential difference alone between the first (25) and the second electrode (27).

3. Device according to claim 1, characterized in that the means for applying a potential difference between the first (25) and the second electrode (27) and the control means supply potential differences so that the value of the electric field in said vicinity of the first electrode (25) is lower than the value which would be due to the potential difference alone between the first (25) and the second electrode (27).

4. Device according to any one of claims 1 to 3, characterized in that the first (25) and the second electrode (27) and the means forming modulation electrode (28, 29) are arranged in parallel.

5. Device according to any one of claims 1 to 4, characterized in that the means forming modulation electrode comprise two electrodes (28, 29) surrounding the first electrode (25).

6. Device according to claim 1 characterized in that when the first electrode is inserted between the second electrode and the means forming modulation electrode, the means forming modulation electrode is made up of a single electrode.

7. Process for producing an electric field between a first electrode (25) and a second electrode (27), comprising:

- the application of a potential difference between the first (25) and the second electrode (27) so

as to obtain, if this potential difference was applied alone, a predetermined value of electric field in the vicinity of the first electrode (25),

- the application of a potential difference between the first electrode (25) and means forming modulation electrode (28, 29) and located near to the first electrode (25), either in the same plane or so that the first electrode is inserted between the second electrode and said means forming modulation electrode, in order to obtain in association with the electric field due to the application of the potential difference between the first (25) and the second electrode (27), another predetermined value of electric field.

8. Process according to claim 7, characterized in that the application of the potential difference between the first (25) and the second electrode (27) is such that, if this potential difference was applied alone, the electric field in said vicinity of the first electrode (25) would be greater than said other predetermined value.

9. Process according to claim 7, characterized in that the application of the potential difference between the first (25) and the second electrode (27) is such that, if this potential difference was applied alone, the electric field in said vicinity of the first electrode (25) would be lower than said other predetermined value.

10. Field emission screen comprising an anode plate (32) and a cathode plate (31) facing one another, the anode plate (32) comprising, on its internal surface of the screen, at least one electrode (37) supporting phosphor means (20), the cathode plate (31) comprising on its internal surface of the screen at least one electrode emitting electrons (35) at least partially facing the anode electrode (37), this cathode electrode (35) becoming emitter of electrons when the electric field in its vicinity exceeds a threshold value, the screen also comprising application means for a potential difference between said anode electrode (37) and said cathode electrode (35), characterized in that the screen further comprises means forming modulation electrode (38, 39) located in the vicinity of the cathode electrode (35), either on the same plane or so that the cathode electrode (35) is inserted between the anode electrode (37) and said means forming modulation electrode, the screen also comprising control means for applying a potential difference between the cathode electrode (35) and the means forming modulation electrode (38,39), the means for applying potential differences is such that it provides for obtaining in said vicinity of the cathode electrode a predetermined value of electric field resulting from the contribution of said potential differences, said predetermined value being as one wishes either lower than said threshold value, or greater than said threshold value.

11. Display screen according to claim 10, characterized in that the means for applying a potential difference between said anode electrode (37) and said cathode electrode (35) is such that, in the absence of a potential difference applied between the cathode electrode (35) and the means forming modulation electrode (38, 39), said predetermined value of electric field is lower than said threshold value.

12. Display screen according to claim 10, characterized in that the means for applying a potential difference between said anode electrode (37) and said cathode electrode (35) is such that, in the absence of potential difference applied between the cathode electrode (35) and the means forming modulation electrode (38, 39), said predetermined value of electric field is greater than said threshold value.

13. Display screen according to any one of claims 10 to 12, characterized in that the means forming modulation electrode comprises two electrodes (38, 39) surrounding said cathode electrode (35).

14. Display screen according to any one of claims 10 to 12, characterized in that, as said cathode electrode is located between said anode electrode and the means forming modulation electrode, the means forming modulation electrode (50) is made up of a single electrode.

15. Display screen according to any one of claims 10 to 12, characterized in that, as said cathode electrode is located between said anode electrode and the means forming modulation electrode, said cathode electrode (35) and the means forming modulation electrode (38, 39) are separated by a layer of insulating material (34).

16. Display screen according to any one of claims 10 to 15, characterized in that as said cathode electrode (35) comprises a conductor element on which is deposited a layer of emissive material (30).

17. Display screen according to claim 16, characterized in that the layer of emissive material (47) is separated from said conductor element (45) by a resistive film (46).

18. Display screen according to claim 17, characterized in that the layer of emissive material (77) only covers part of the resistive film (76).

19. Display screen according to claim 17, characterized in that the emissive material (97) is a material deposited on the resistive film (96) by means of a catalyst material (92) deposited on the resistive film (96) and on which the emissive material (97) settles preferentially.

20. Display screen according to any one of claims 10 to 19, characterized in that it is of the matrix

type, the crossing of lines and columns defining pixels.

21. Display screen according to claim 10, characterized in that the anode plate comprises a common electrode with phosphor means, the cathode plate (81) comprises a plate (83) with conductor lines (Y_i,Y_j,Y_k) constituting the means forming modulation electrode, covered with a layer of dielectric material (84), the layer of dielectric material supporting conductor columns (85), the lines and columns forming a matrix arrangement connected to addressing means and defining pixels, the conductor columns having an emissive material (87).

22. Display screen according to claim 21, characterized in that each pixel corresponds to the crossing of a line (Y_i,Y_j,Y_k) and several conductor columns (85).

23. Display screen according to claims 21 or 22, characterized in that the conductor lines (Y_i,Y_j,Y_k) comprise windows (80) facing the conductor columns (85), the emissive material (87) supported by the conductor columns being only present on the areas of the conductor columns corresponding to the windows (80).

24. Process for the use of a field emission display screen comprising at least one anode electrode (37) and at least one cathode electrode (35) facing one

another, the cathode electrode comprising an emissive material (30) emitting electrons when the electric field in the vicinity of the cathode electrode (35) exceeds a threshold value, characterized in that, in order to obtain an emission of electrons from the emissive material, it comprises:

- the application of a potential difference between the anode electrode (37) and the cathode electrode (35) so as to obtain in the vicinity of the cathode electrode, if this potential difference was applied alone, an electric field of lower value than said threshold value,

- the application of a potential difference between the cathode electrode (35) and the means forming modulation electrode (38, 39) located near the cathode electrode, either in the same plane or so that the cathode electrode is inserted between the anode electrode and said means forming modulation electrode, so as to obtain in said vicinity of the cathode electrode, in association with the electric field due to the application of the potential difference between the anode (37) and cathode (35) electrodes, an electric field value greater than said threshold value.

25. A process for the use of a field emission display screen comprising at least one anode electrode (37) and at least one cathode electrode (35) facing one another, the cathode electrode comprising an emissive material (30) emitting electrons when the electric field in the vicinity of the cathode electrode (35) exceeds a threshold value, characterized in that, in

order to avoid an emission of electrons from the emissive material, it comprises:

- the application of a potential difference between the anode electrode (37) and the cathode electrode (35) so as to obtain in the vicinity of the cathode electrode, if this potential difference was applied alone, an electric field of greater value than said threshold value,

- the application of a potential difference between the cathode electrode (35) and means forming modulation electrode (38, 39) located in the vicinity of the cathode electrode, either in the same plane or so that the cathode electrode is inserted between the anode electrode and said means forming modulation electrode, so as to obtain in said vicinity of the cathode electrode, in association with the electric field due to the application of the potential difference between the anode (37) and cathode (35) electrodes, an electric field value lower than said threshold value.

ABSTRACT

The present invention concerns a device designed to produce an electric field between two electrodes (35,37), this electric field must have a specified value in the vicinity of one (35) of these two electrodes, the device comprising means for applying a potential difference between these two electrodes, the device comprising means forming modulation electrode (38,39) located near to said electrode (35) in the vicinity of which the electric field must have a specified value. The device also comprises control means for applying a potential difference between the means forming modulation electrode (38,39) and said electrode (35) located nearby in order to obtain, through the contribution of said potential differences, said specified value of electric field.

Figure 4.

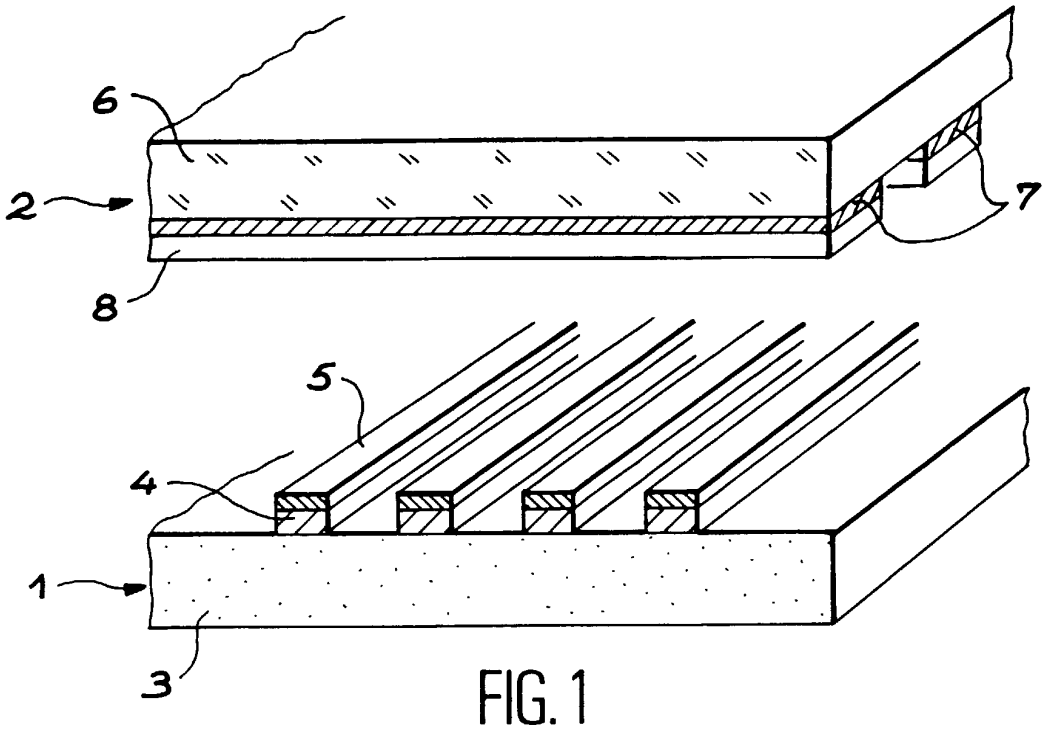

FIG. 1

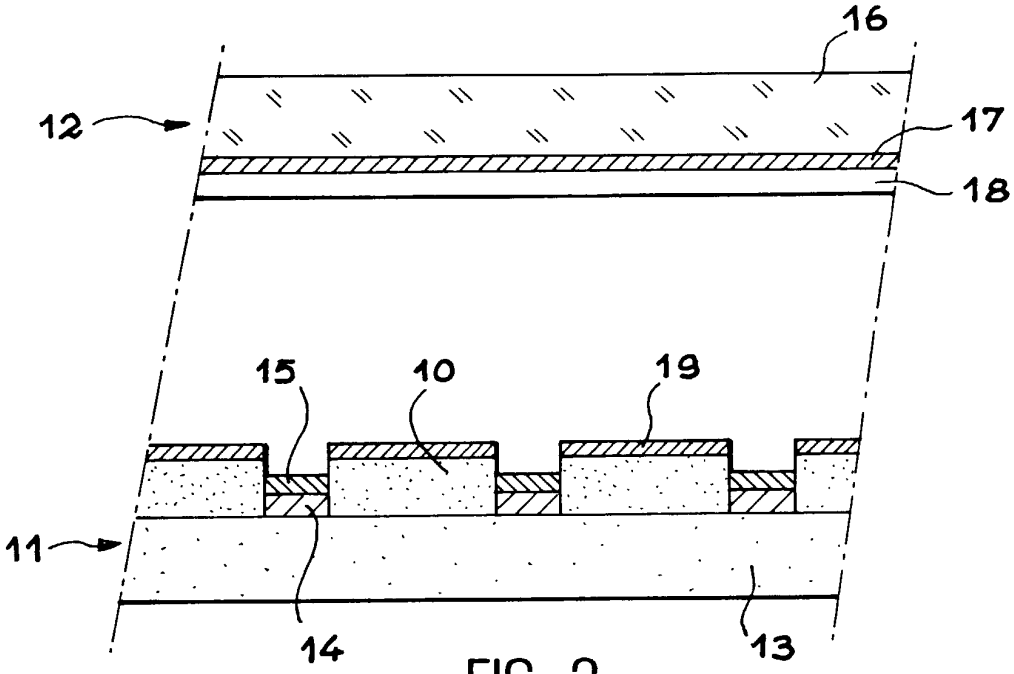

FIG. 2

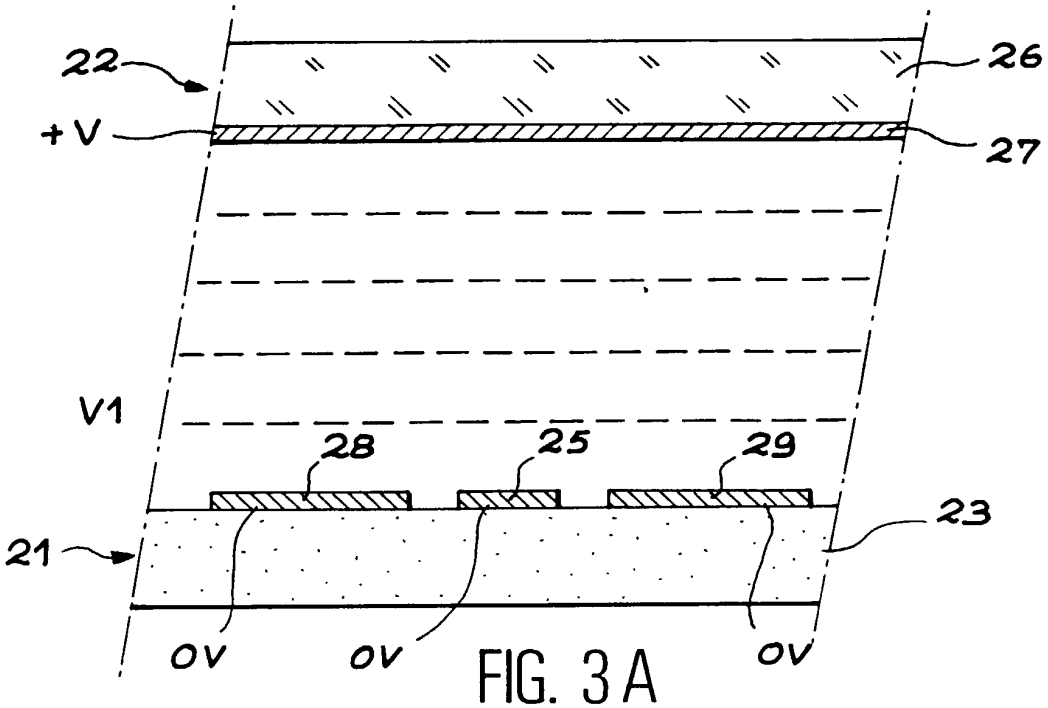

FIG. 3A

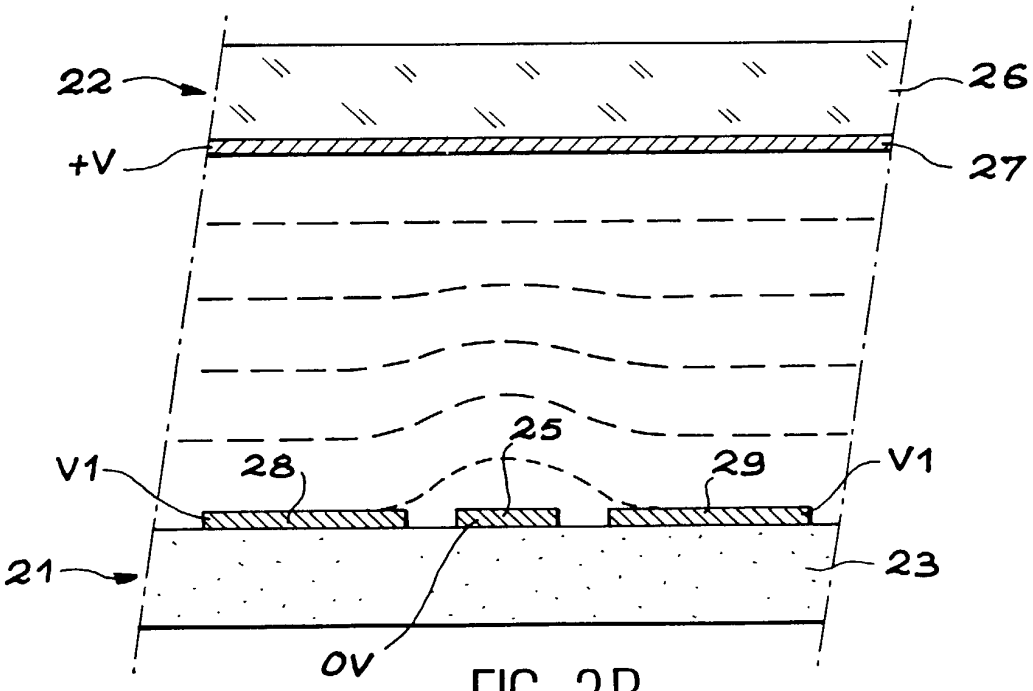

FIG. 3B

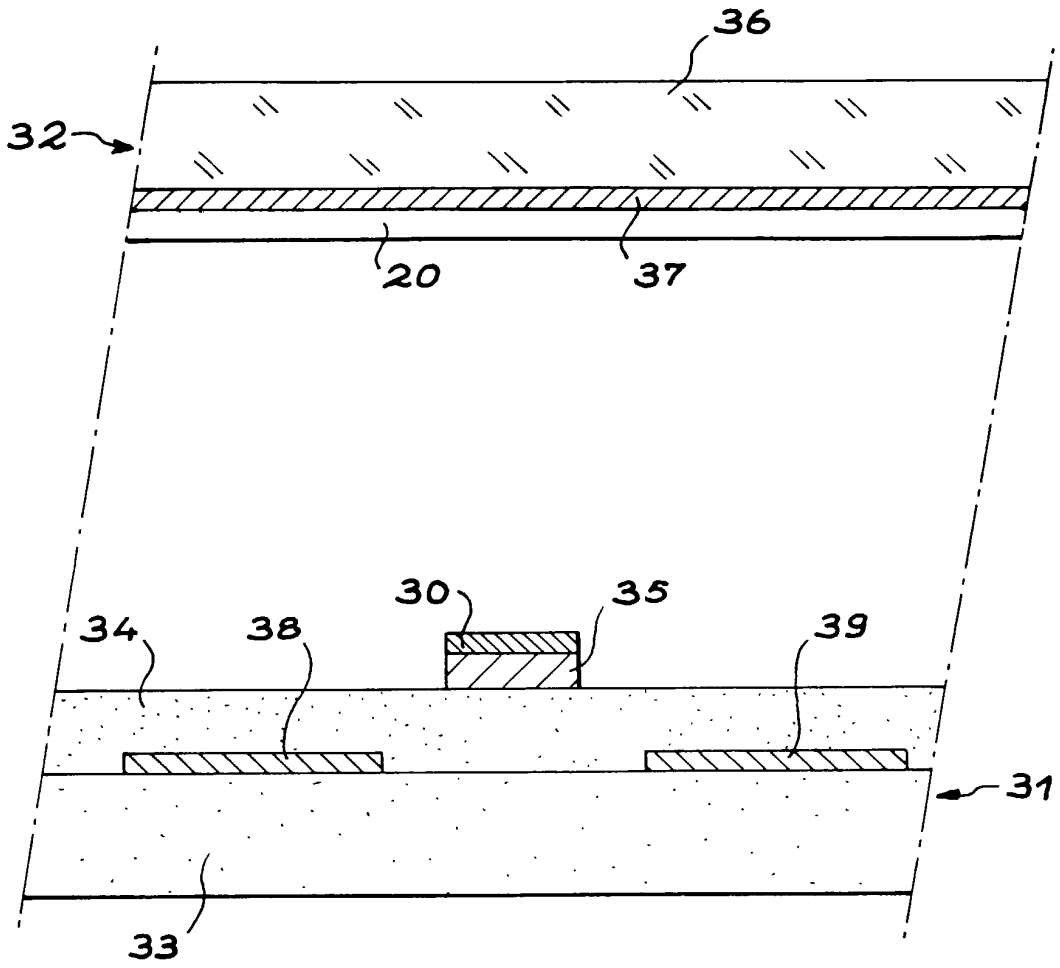

FIG. 4

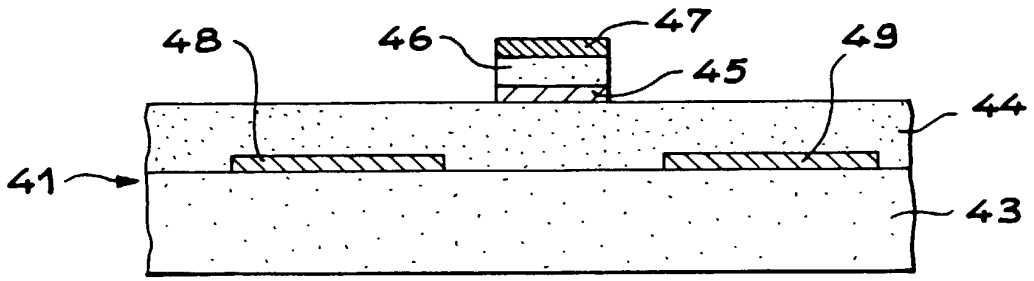

FIG. 5

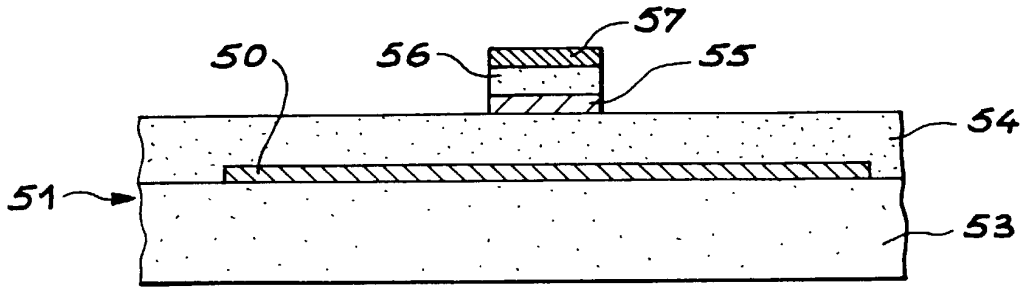

FIG. 6

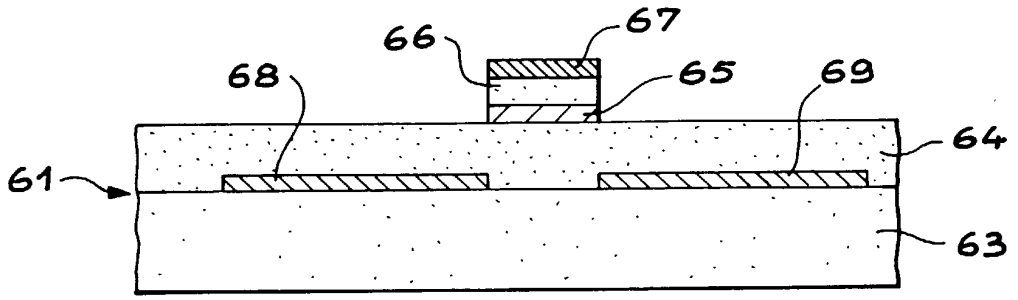

FIG. 7

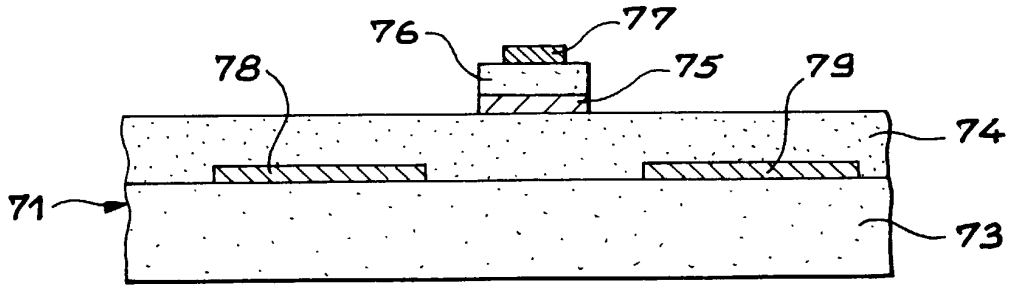

FIG. 8

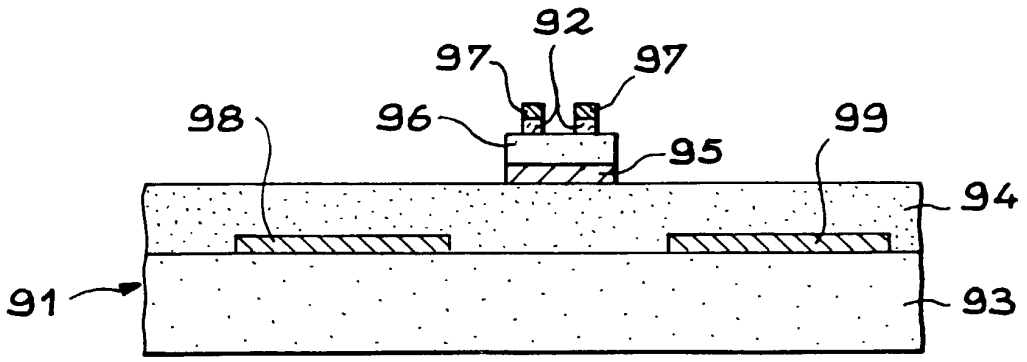

FIG. 9

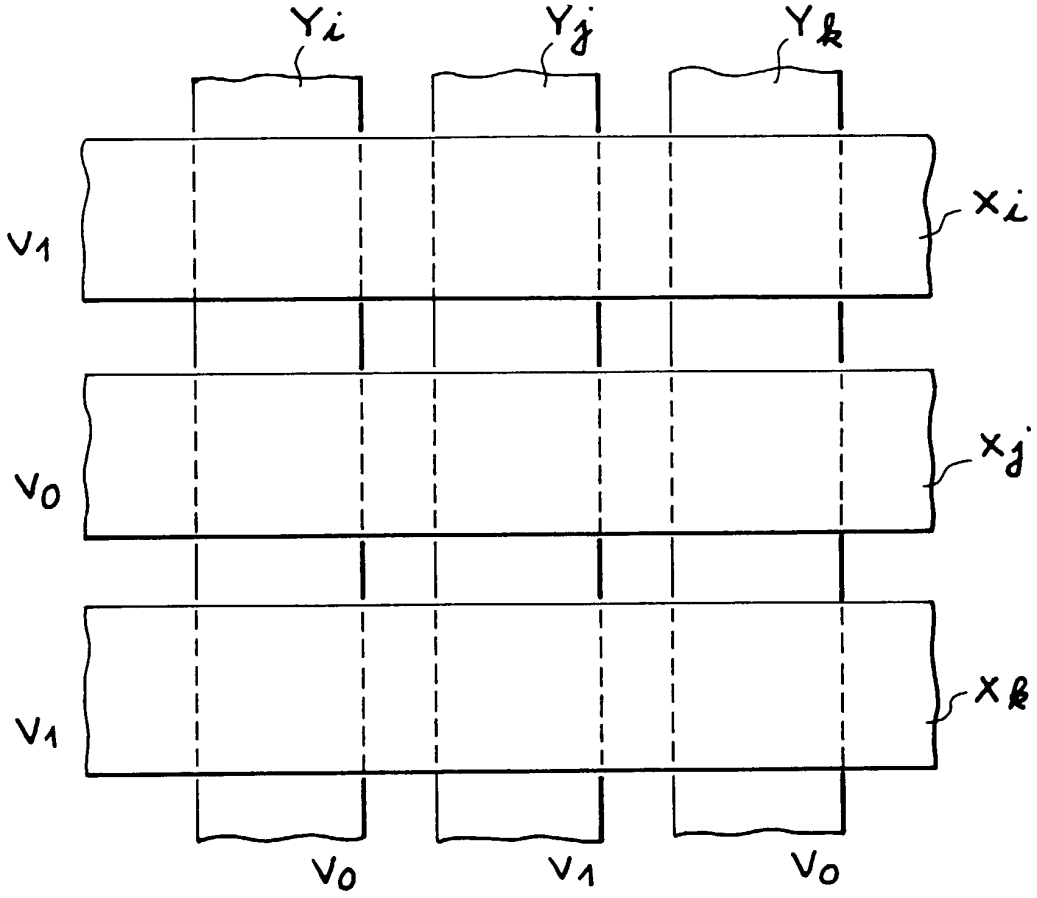

FIG. 11

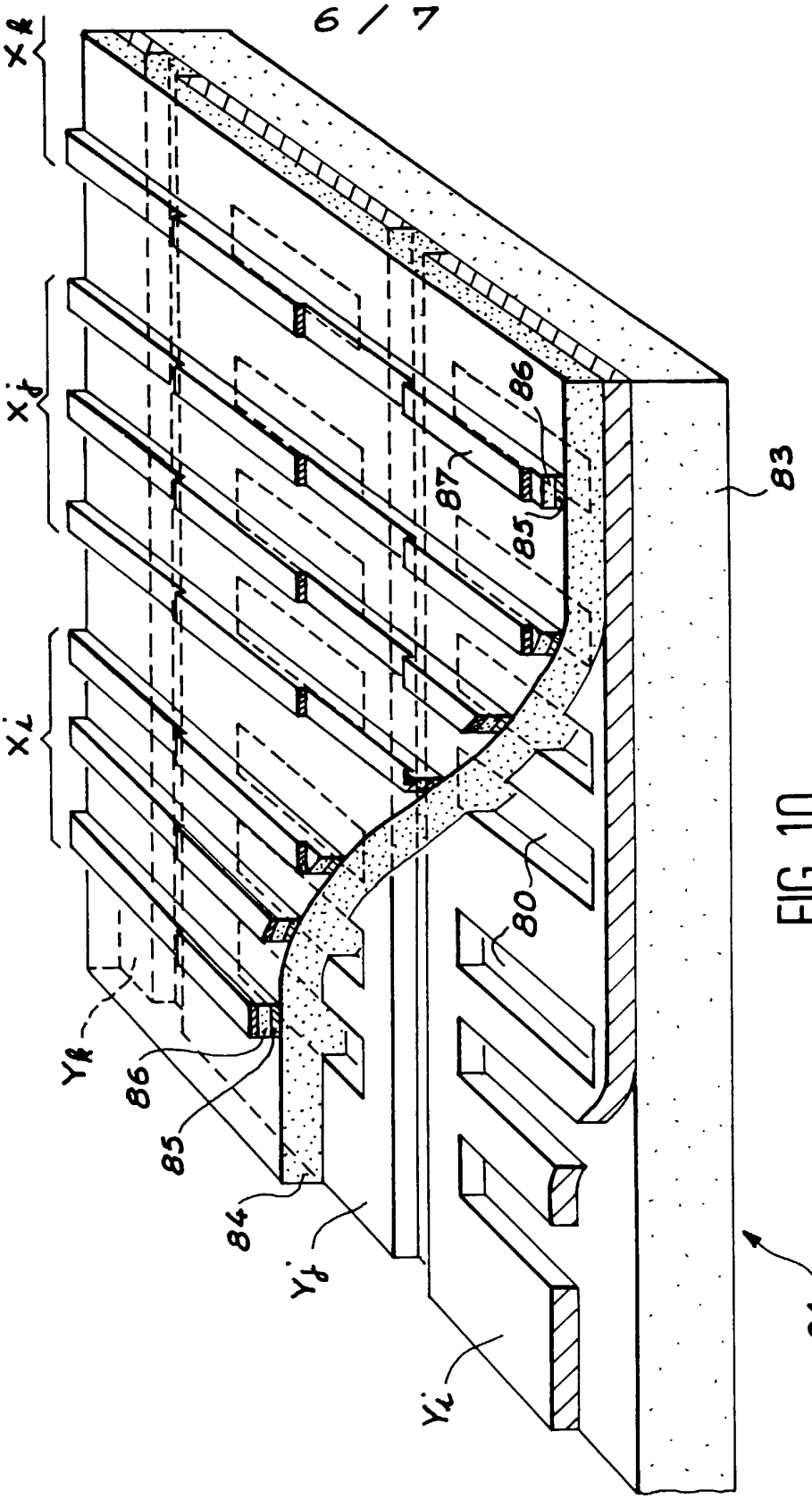

FIG. 10

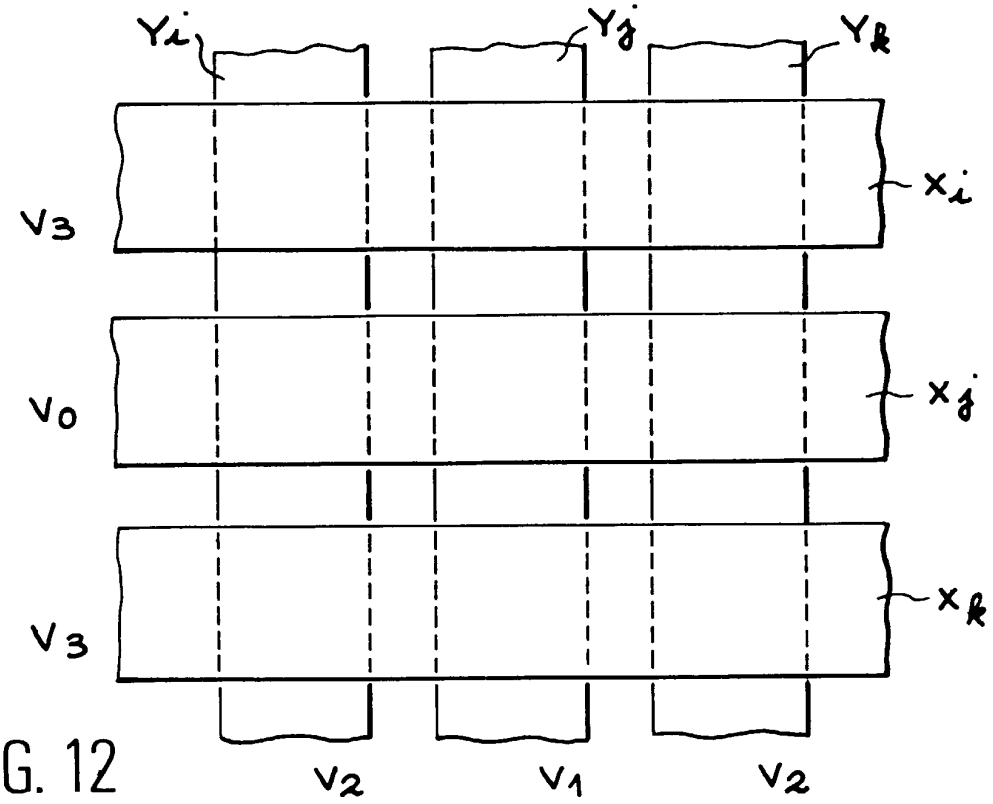
Yi
Yj
Yk
Xi
Xj
Xk
V3
V0
V3
V2
V1
V2

FIG. 12

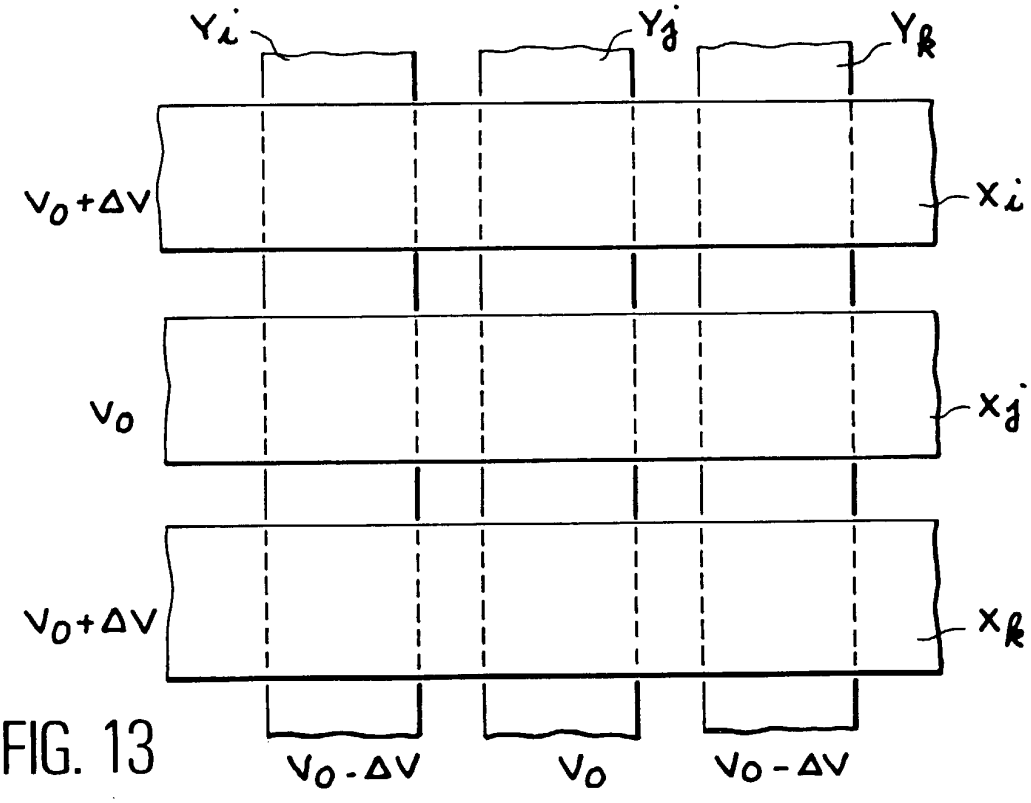
Yi
Yj
Yk
Xi
Xj
Xk
V0+ΔV
V0
V0+ΔV
V0-ΔV
V0
V0-ΔV

FIG. 13

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Docket No 034299-386

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT: Perrin, et al.

SERIAL NO.: 10/049,777

Rec'd PCT/PTO 21 MAY 2002

FILING DATE: February 19, 2002

TITLE: DEVICE FOR PRODUCING A MODULATED ELECTRIC FIELD FOR AN ELECTRODE AND ITS APPLICATION IN FLAT FIELD EMISSION SCREENS

EXAMINER: Unassigned

ART UNIT: Unassigned

CERTIFICATE OF MAILING

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Date: 5/21/02 Name: Sharon Byam

Sharon Byam

COMMISSIONER FOR PATENTS
WASHINGTON, D.C. 20231

CHANGE OF ATTORNEY DOCKET NUMBER AND CHANGE OF ADDRESS NOTICE

Please change the Attorney Docket No. for this patent application from

025219-386 to **034299-386** .

Please address all further communications regarding this application to:

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Respectfully submitted,
THELEN REID & PRIEST LLP

Dated: 5/20/02

Robert E. Krebs
Reg. No. 25,885

Rec'd PCT/PTO 21 MAY 2002 10049777 .052102

Docket No 034299-386

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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Date: 5/21/02 Name: Sharon Byam

Sharon Byam

COMMISSIONER FOR PATENTS
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REVOCATION OF ATTORNEY AND POWER OF ATTORNEY

The undersigned, having authority to act on behalf of Commissariat a L'Energie Atomique, assignee of all right, title, and interest in the above-identified patent application by virtue of the attached Power of Attorney, hereby revokes all powers of attorney previously given and hereby appoints, Robert E. Krebs, Registration No. 25,885; David B. Ritchie, Registration No. 31,562; Marc S. Hanish, Registration No. 42,626; John P. Schaub, Registration No. 42,125; Adrienne Yeung, Registration No. 44,000; Steven J. Robbins, Registration No. 40,299; Thierry Lo, Registration No. 49,097; W. Samuel Niece, Registration No. 47,824; J. Davis Gilmer, Registration No. 44,711 and William E. Winters, Registration No. 42,232, as its attorneys to act on applicant's behalf

before the United States Patent and Trademark Office for the above-identified application and to transact all business in the Patent and Trademark Office in connection therewith.

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Respectfully submitted,
THELEN REID & PRIEST LLP

Dated: 5/20/02

Robert E. Krebs
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OIPE JC10 JUL 22 2002 PATENT & TRADEMARK OFFICE

Declaration, Power Of Attorney and Petition

WE (I) the undersigned inventor(s), hereby declare(s) that :

My residence, post office address and citizenship are as stated below next to my name,

We (I) believe that we are (I am) the original, first, and joint (sole) inventor(s) of the subject matter which is claimed and for which a patent is sought on the invention entitled

DEVICE FOR PRODUCING A MODULATED ELECTRIC FIELD FOR AN ELECTRODE AND ITS APPLICATION IN FLAT FIELD EMISSION SCREENS

the specification of which

☐ is attached hereto.

☐ was filed on

as Application Serial No.

and amended on

☒ was filed as PCT international application

Number PCT/FR00/02487

on September 08, 2000

and was amended under PCT Article 19

on

We (I) hereby state that we (I) have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

We (I) acknowledge the duty to disclose information known to be material to the patentability of this application as defined in Section 1.56 of Title 37 Code of Federal Regulations.

We (I) hereby claim foreign priority benefits under 35 U.S.C. § 119 (a)-(d) or § 365 (b) of any foreign application(s) for patent or inventor's certificate, or § 365 (a) of any PCT International application which designated at least one country other than the United States, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or PCT International application having a filing date before that of the application on which priority is claimed. Prior Foreign Application (s)

Application No.	Country	Day/month/Year	Priority Claimed
99 11292	FRANCE	09 SEPTEMBER 1999	☒ YES ☐ NO
00 01832__	FRANCE	15 FEBRUARY 2000	☒ YES ☐ NO
			☐ YES ☐ NO
			☐ YES ☐ NO

We (I) hereby claim the benefit under Title 35, United States Code, § 119 (e) of any United States provisional application(s) listed below.

(Application Number) (Filing Date)

(Application Number) (Filing Date)

We (I) hereby claim the benefit under 35 U.S.C. §120 of any United States application(s), or § 365(c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of 35 U.S.C. § 112, I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR § 1.56 which became available between the filing date of prior application and the national or PCT International filing date of this application.

Application Serial No.	Filing Date	Status (pending, patented, abandoned)

And we (I) hereby appoint : William L. Mathis, Registration Number 17,337; Robert S. Swecker, Registration Number 19,885, Platon N. Mandros, Registration Number 22,124; Benton S. Duffett Jr., Registration Number 22,030; Norman H. Stepno, Registration Number 22,716; Ronald L. Grudziecki, Registration Number 24,970; Frederick G. Michaud Jr, Registration Number 26,003; Alan E. Kopecki, Registration Number 25,813; Regis E. Slutter, Registration Number 26,999; Samuel C. Miller III, Registration Number 27,360; Robert G. Mukai, Registration Number 28,531; George A. Hovanec, Jr. Registration Number 28,223; James A. Labarre, Registration Number 28,632; E. Joseph Gess, Registration Number 28,510; R. Danny Huntington, Registration Number 27,903; Eric H. Weisblatt, Registration Number 30,505; James W. Peterson, Registration Number 26,057; Teresa Stanek REA, Registration Number 30,427; Robert E. Krebs, Registration Number 25,885; William C. Rowland, Registration Number 30,888; T. Gene Dillahunty, Registration Number 25,423; Patrick C. Keane, Registration Number 32,858; Bruce J. Boggs, Jr. Registration Number 32,344; William H. Benz, Registration Number 25,952; Peter K. Skiff, Registration Number 31,917; Richard J. McGrath, Registration Number 29,195; Matthew L. Schneider, Registration Number 32,814; Michael G. Savage, Registration Number 32,596; Gerald F. Swiss, Registration Number 30,113; Michael J. Ure, Registration Number 33,089; Charles F. Wieland III, Registration Number 33,096; Bruce T. Wieder, Registration Number 33,815; Todd R. Walters, Registration Number 34,040; Ronni S. Jillions, Registration Number 31,979; Harold R. Brown III, Registration Number 36,341; Allen R. Baum, Registration Number 36,086; Steven M. Du Bois, Registration Number 35,023; Brian P. O'Shaughnessy, Registration Number 32,747; Kenneth B. Leffler, Registration Number 36,075 and Fred W. Hathaway, Registration Number 32,236 our (my) attorneys, with full powers of substitution and revocation, to prosecute this application and to transact all business in the Patent Office connected therewith; and we (I) hereby request that all correspondence regarding this application be sent to the firm of BURNS, DOANE, SWECKER & MATHIS LLP, whose post Office Address is : 1737 King Street #400, Alexandria, Virginia 22314-2727.

We (I) declare that all statements made herein of our (my) own knowledge are true and that all statements made on information and belief are believed to be true ; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such wilful false statements may jeopardise the validity of the application or any patent issuing thereon.

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